CLAIMS

The invention claimed is:

1. A method for designing a profile extrusion die, comprising the steps of:

Defining a cross-sectional profile geometry for a desired extrusion, the cross-sectional profile geometry having at least one external edge, and at least one major cross-sectional diameter;

Constructing a finite element plate model having the cross-sectional profile geometry and a plurality of edge points;

Constraining the finite element plate model at the edge points;

Creating a pressurized finite element plate model by applying pressure to a side of the finite element plate model to deflect a surface of the finite element plate model;

Creating a measured edge deflection by measuring a deflection of at least one edge of the pressurized finite element plate model;

Calculating a multiplication factor to be used for scaling at least one measured edge deflection;

Calculating at least one corrected edge deflection by applying the multiplication factor to a measured edge deflection; and

Creating a final profile die geometry, by repeating the step of calculating at least one corrected edge deflection until a die profile shape is defined.

2. A method for designing a profile extrusion die according to claim 1, wherein the finite element plate model has a thickness of about ten percent of the major cross-sectional diameter of the finite element plate model

3. A method for designing a profile extrusion die according to claim 2, wherein the finite element plate model has mechanical properties of a rubber material.

4. A method for designing a profile extrusion die according to claim 3, wherein cross-sectional profile geometry further comprises internal edges and internal edge points.

5. A method for designing a profile extrusion die according to claim 4, wherein the pressure applied to a side of the finite element plate model deflects a surface of the finite element plate model by no more than the thickness of the finite element plate model.

6. A method for designing a profile extrusion die according to claim 5, wherein the finite element plate model is constructed using a computer software program.

7. A method for designing a profile extrusion die according to claim 6, wherein the measured edge deflection is created using a computer software program.

8. A method for designing a profile extrusion die according to claim 7, wherein the multiplication factor is calculated using a computer software program.

9. A method for designing a profile extrusion die according to claim 8, wherein the corrected edge deflection is calculated using a computer software program.

10. A method for designing a profile extrusion die according to claim 9, wherein the final profile geometry is created using a computer software program.

11. A method for designing a profile extrusion die according to claim 10, further comprising the additional step of transferring the final profile geometry to a numerically controlled machine configured to manufacture a profile die.

12. A numerically controlled machine for converting a desired extrusion profile geometry to a manufactured profile extrusion die, comprising:

Means for inputting a cross-sectional profile geometry for a desired extrusion, the profile geometry having at least one external edge and at least one major cross-sectional diameter;

Means for constructing a finite element plate model with the cross-sectional profile geometry, a thickness of approximately ten percent of the major cross-sectional diameter,

mechanical properties of a rubber material, and a plurality of edge points;

Means for constraining the finite element plate model by pinning at the edge points;

Means for creating a pressurized finite element plate model by applying pressure to a side of the finite element plate model to deflect a surface of the finite element plate model by no more than the thickness of the finite element plate model;

Means for creating a measured edge deflection by measuring a deflection of at least one edge of the pressurized finite element plate model;

Means for calculating a multiplication factor to be used for scaling at least one measured edge deflection;

Means for calculating at least one corrected edge deflection by applying the multiplication factor to a measured edge deflection;

Means for creating a final profile geometry, by repeating the step of calculating at least one corrected edge deflection until a die profile shape is defined; and

Means for removing material from a production blank to produce a manufactured profile die according to the defined die profile shape.

14. A numerically controlled machine for converting a desired extrusion profile geometry to a manufactured profile extrusion die according to claim 13, wherein the numerically controlled machine is a milling machine.

15. A numerically controlled machine for converting a desired extrusion profile geometry to a manufactured profile extrusion die according to claim 13, wherein the numerically controlled machine is an electron discharge machine.

16. A numerically controlled machine for converting a desired extrusion profile geometry to a manufactured profile extrusion die according to claim 15, wherein the electron discharge machine is a wire electron discharge machine.

17. An electronic control system for converting a desired cross-sectional profile geometry to a final profile die geometry, comprising:

Means for inputting a cross-sectional profile geometry for a desired extrusion, the profile geometry having at least one external edge and at least one major cross-sectional diameter;

Means for constructing a finite element plate model with the cross-sectional profile geometry, a thickness of approximately ten percent of the major cross-sectional diameter, mechanical properties of a rubber material, and a plurality of edge points;

Means for constraining the finite element plate model by pinning thereof at the edge points;

Means for creating a pressurized finite element plate model by applying pressure to a side of the finite element plate model to deflect a surface of the finite element plate model by no more than the thickness of the finite element plate model;

Means for creating a measured edge deflection by measuring a deflection of at least one edge of the pressurized finite element plate model;

Means for calculating a multiplication factor to be used for scaling at least one measured edge deflection;

Means for calculating at least one corrected edge deflection by applying the multiplication factor to a measured edge deflection; and

Means for creating a final profile die geometry, by repeating the step of calculating at least one corrected edge deflection until a die profile shape is defined.